

PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2002-032074

(43)Date of publication of application : 31.01.2002

(51)Int.Cl.

G09G 5/36
G06T 3/40
H04N 1/387
H04N 1/48
H04N 5/66
H04N 9/64

(21)Application number : 2000-217346

(71)Applicant : MATSUSHITA ELECTRIC IND CO LTD

(22)Date of filing : 18.07.2000

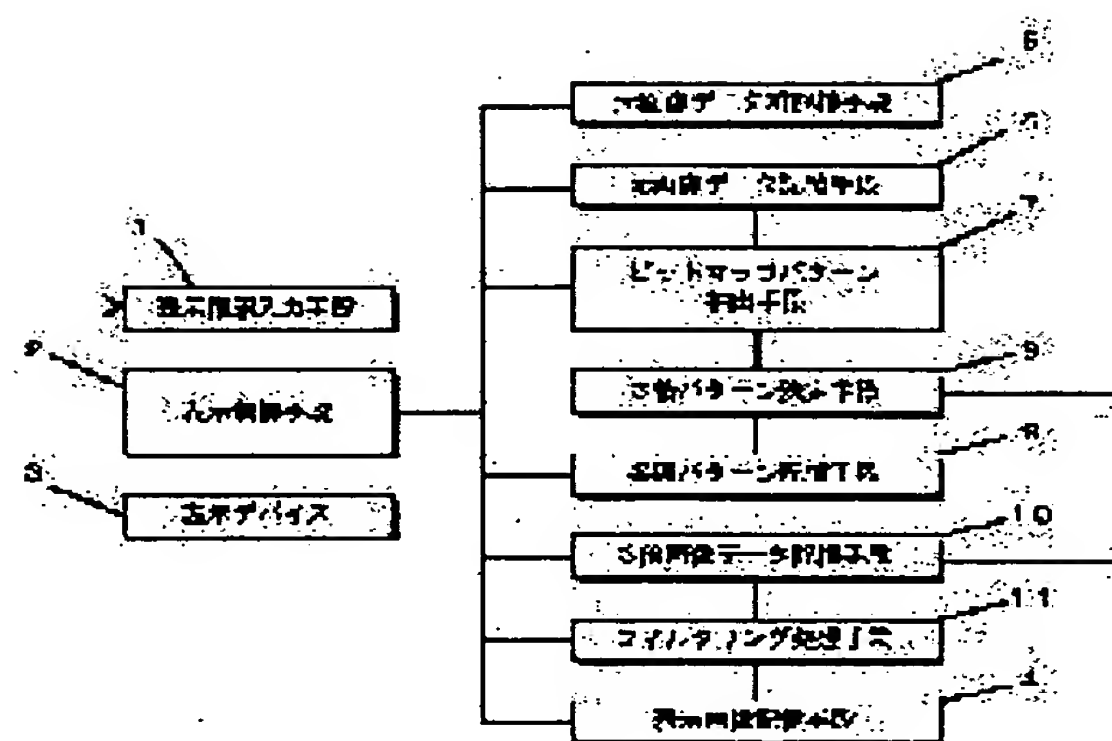
(72)Inventor : TAJI BUNPEI
TEZUKA TADANORI
YOSHIDA HIROYUKI

(54) DISPLAY DEVICE, DISPLAY METHOD AND RECORDING MEDIUM WITH RECORDED DISPLAY CONTROL PROGRAM

(57)Abstract:

PROBLEM TO BE SOLVED: To perform sub-pixel display using a property of a color display device, moreover disburdens system resources, and also correspond to the case when a three-fold picture is unknown.

SOLUTION: One pixel composed of three light emitting elements respectively emitting light of RGB prime colors arranged in a certain order is arranged side by side in the 1st direction to form one line, and the plural lines are arranged in the 2nd direction orthogonal to the 1st direction, and thereby a display device composing the display screen is made to perform displaying. A raster picture to be displayed this time is displayed by allocating this three-fold pattern to the three light emitting elements composing one pixel, by dynamically deciding a three-fold pattern obtained by magnifying the noteworthy pixel in the 1st direction according to a rectangular reference pattern consisting of the noteworthy pixel and 3×3 pixels surrounding this noteworthy pixel.



LEGAL STATUS

[Date of request for examination]	18.07.2000
[Date of sending the examiner's decision of rejection]	17.04.2003
[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]	
[Date of final disposal for application]	
[Patent number]	3466139
[Date of registration]	29.08.2003
[Number of appeal against examiner's decision of rejection]	2003-08798
[Date of requesting appeal against examiner's decision of rejection]	16.05.2003
[Date of extinction of right]	

Copyright (C); 1998,2003 Japan Patent Office

*** NOTICES ***

JPO and NCIP are not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.

2. **** shows the word which can not be translated.

3. In the drawings, any words are not translated.

CLAIMS

[Claim(s)]

[Claim 1] Install three light emitting devices which emit light in the RGB three primary colors, respectively in fixed sequence, and 1 pixel is constituted. The display device which installs this pixel in the 1st direction, constitutes one line, prepares two or more these lines in the 2nd direction which intersects perpendicularly in said 1st direction, and constitutes a display screen, A display image storage means to memorize the display image information which should be displayed on said display device, A former image data storage means to memorize the raster image which should be equipped with a display-control means to make it display on said display device, based on the display-image information which said display-image storage means memorizes, and should be displayed this time, Based on the raster image of said former image data storage means, it has a 3 time pattern decision means to determine the 3 time pattern which doubled resolution three per said 1st direction. For said display image storage means While the display image information based on the 3 time pattern which the pattern decision means determined said 3 times is memorized, a pattern decision means said 3 times In the raster image which said former image data storage means memorizes An attention pixel, The reference pattern of the rectangle which consists of a pixel of a sum total $(2n+1) \times (2m+1)$ (n and m are the natural number) individual which encloses this attention pixel is followed. It is the display which determines the 3 time pattern which expanded the attention pixel concerned in said 1st direction 3 times, and is characterized by for said display-control means assigning a pattern to three light emitting devices which constitute 1 pixel these 3 times, and making it display on said display device.

[Claim 2] The display according to claim 1 which are $n=1$ and $m=1$.

[Claim 3] The raster image which said former image data storage means memorizes is a display according to claim 1 or 2 characterized by being either the bitmapped image which carried out raster expansion of a bit-mapped font and the vector font, or the raster image which is not a font.

[Claim 4] Said 3 time pattern decision means is a display given in three from claim 1 characterized by determining a pattern 3 times with reference to a reference pattern storage means to memorize a pattern decision rule 3 times.

[Claim 5] The display according to claim 4 characterized by storing the information for pattern matching of a reference pattern in said reference pattern storage means.

[Claim 6] The display according to claim 4 characterized by for the bit string which carried out the bit expression of the reference pattern, and the information which shows the 3 time pattern concerning this bit string matching, and storing it in said reference pattern storage means.

[Claim 7] Said 3 time pattern decision means is a display given in three from claim 1 characterized by determining a pattern 3 times 3 times which performs logical operation based on said reference pattern with reference to the result of an operation of a pattern logical operation means.

[Claim 8] Install three light emitting devices which emit light in the RGB three primary colors, respectively in fixed sequence, and 1 pixel is constituted. In the raster image which should be displayed this time in making it display on the display device which installs this pixel in the 1st direction, constitutes one line, prepares two or more these lines in the 2nd direction which intersects perpendicularly in said 1st direction, and constitutes a display screen The reference pattern of the

rectangle which consists of an attention pixel and a pixel of the sum total $(2n+1) \times (2m+1)$ (n and m are the natural number) individual which encloses this attention pixel is followed. The method of presentation characterized by determining the 3 time pattern which expanded the attention pixel concerned in said 1st direction 3 times, assigning a pattern to three light emitting devices which constitute 1 pixel these 3 times, and making it display on said display device.

[Claim 9] The method of presentation according to claim 8 which are $n=1$ and $m=1$.

[Claim 10] Said raster image is the method of presentation according to claim 8 or 9 characterized by being either the bitmapped image which carried out raster expansion of a bit-mapped font and the vector font, or the raster image which is not a font.

[Claim 11] The method of presentation given in ten from claim 8 characterized by determining a pattern 3 times with reference to a reference pattern storage means to memorize a pattern decision rule 3 times in case a pattern is determined 3 times.

[Claim 12] The method of presentation according to claim 11 characterized by storing the information for pattern matching of a reference pattern in said reference pattern storage means.

[Claim 13] The method of presentation according to claim 11 characterized by for the bit string which carried out the bit expression of the reference pattern, and the information which shows the 3 time pattern concerning this bit string matching, and storing it in said reference pattern storage means.

[Claim 14] The method of presentation given in ten from claim 8 characterized by determining a pattern 3 times 3 times which performs logical operation based on said reference pattern with reference to the result of an operation of a pattern logical operation means in case a pattern is determined 3 times.

[Claim 15] Install three light emitting devices which emit light in the RGB three primary colors, respectively in fixed sequence, and 1 pixel is constituted. Install this pixel in the 1st direction, constitute one line, and two or more these lines are prepared in the 2nd direction which intersects perpendicularly in said 1st direction. In the raster image which is the program which makes it display on the display device which constitutes a display screen, and should be displayed this time The reference pattern of the rectangle which consists of an attention pixel and a pixel of the sum total $(2n+1) \times (2m+1)$ (n and m are the natural number) individual which encloses this attention pixel is followed. The record medium which recorded the display-control program which the 3 time pattern which expanded the attention pixel concerned in said 1st direction 3 times is determined [program], and you assign [program] a pattern to three light emitting devices which constitute 1 pixel these 3 times, and makes it display on said display device.

[Translation done.]

*** NOTICES ***

JPO and NCIP are not responsible for any damages caused by the use of this translation.

1.This document has been translated by computer. So the translation may not reflect the original precisely.

2.**** shows the word which can not be translated.

3.In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to a display and its related technique.

[0002]

[Description of the Prior Art] Before, the display using various display devices is used. Three light emitting devices which emit light in the RGB three primary colors, respectively, such as a color LCD and a color plasma display, are put in order in fixed sequence among such indicating equipments, and it considers as 1 pixel, and this pixel is installed in the 1st direction, one line is constituted, two or more these lines are prepared in the 2nd direction which intersects perpendicularly in the 1st direction, and there are some which constitute the display screen.

[0003] Now, like the display device carried in a cellular phone, a mobile computer, etc., for example, a display screen is comparatively narrow and there are also many display devices which a fine display cannot perform easily. If it is going to display a small alphabetic character, a photograph or a complicated picture, etc., some images will be crushed by such display device, and it will be easy to become indistinct with it.

[0004] In order to improve the visibility of a display in a narrow screen, the reference (title : "Sub Pixel Font Rendering Technology") about a subpixel display which used on the Internet the point that 1 pixel consisted of light emitting devices of three RGB is exhibited. this invention persons downloaded and checked this reference from a site (<http://grc.com>) or its subordinate on June 19, 2000.

[0005] Next, this technique is explained, referring to drawing 12 - drawing 16 . Hereafter, the English character "A" is taken up as an example of the image to display.

[0006] Now, drawing 12 displays typically [one line] in the case of constituting 1 pixel from three light emitting devices in this way. The longitudinal direction (direction where the light emitting device of the RGB three primary colors is located in a line) in drawing 12 is called 1st direction, and the lengthwise direction which intersects perpendicularly with this is called 2nd direction.

[0007] In addition, although the method of a list of the others which are not the order of RGB is also considered, even if the method of a list of a light emitting device itself changes how to be located in a line, this conventional technique and this invention are applicable similarly.

[0008] And this 1 pixel (three light emitting devices) is arranged in a single tier in the 1st direction, and one line is constituted. Furthermore, this line is put in order in the 2nd direction and the display screen is constituted.

[0009] Now, with this subpixel technique, a former image is an image as shown in drawing 13 . In this example, the alphabetic character "A" is displayed on the field of every 7 pixels of every direction. On the other hand, in order to perform a subpixel display, when it is considered that the light emitting device of each RGB is 1 pixel, as it is shown in drawing 14 about the field taken 7 pixels in the longitudinal direction in 21 (= 7x3) pixel and the lengthwise direction, the font which has one 3 times the resolution of this in a longitudinal direction is prepared.

[0010] And as shown in drawing 15 , a color is defined about each pixel (not drawing 14 but pixel of drawing 13) of drawing 13 . However, if it displays as it is, since an irregular color will occur, filtering processing by the multiplier as shown in drawing 16 (a) is performed. Drawing 16 (a) shows the multiplier to brightness, by 3/9 time and its next pixel, 2/9 time, further, it multiplies by the multiplier, such as 1/9 time, and the brightness of each pixel is adjusted by the next pixel, at a main attention pixel:

[0011] Thus, if filtering processing is performed to the pixel of the color shown in drawing 15 , it will become like drawing 16 (b) and a color will be adjusted like dark blue with thin light blue with a thin light blue, yellow with thin yellow, brown with thin reddish brown, and dark blue.

[0012] Thus, the image which performed filtering processing is assigned to each light emitting device of drawing 14 , and a subpixel display is performed.

[0013]

[Problem(s) to be Solved by the Invention] However, with this technique, the image (drawing 14) which expanded resolution in the 1st direction 3 times must be held separately and statically to a former image (drawing 13).

[0014] Generally, a big system resource is needed only by the class of font increasing like a font what manages many images all together. Especially, it is difficult like a cellular phone and a mobile computer to adopt the technique in which a big system resource in this way is needed what has many limits of a system resource.

[0015] Furthermore, since it will be the requisite that the image itself doubled three can use statically, the display which doubled resolution three cannot be performed about former images of arbitration, such as a photograph-of-his-face image downloaded from the server.

[0016] Thus, although it was not impossible in a Prior art to have performed a subpixel display, the burden of a system resource was large and there was a trouble that the range which can perform a subpixel display was restricted.

[0017] Then, the burden of a system resource is light and this invention aims at offering a ream technique a display and in the meantime which can moreover perform a subpixel display 3 times even if an image is not known.

[0018]

[Means for Solving the Problem] Install three light emitting devices which emit light in the RGB three primary colors, respectively in fixed sequence, and 1 pixel is constituted from this invention. In the raster image which should be displayed this time in making it display on the display device which installs this pixel in the 1st direction, constitutes one line, prepares two or more these lines in the 2nd direction which intersects perpendicularly in the 1st direction, and constitutes a display screen The reference pattern of the rectangle which consists of an attention pixel and a pixel of the sum total $(2n+1) \times (2m+1)$ (n and m are the natural number) individual which encloses this attention pixel is followed. The 3 time pattern which expanded the attention pixel concerned in the 1st direction 3 times is determined, a pattern is assigned to three light emitting devices which constitute 1 pixel these 3 times, and it is made to display on a display device.

[0019] By this configuration, the burden of a system resource is light, and moreover, even if the image to which resolution was expanded 3 times is not known, a subpixel display can be performed.

[0020]

[Embodiment of the Invention] Install three light emitting devices which emit light in the RGB three primary colors, respectively in fixed sequence, and 1 pixel is constituted from a display according to claim 1. The display device which installs this pixel in the 1st direction, constitutes one line, prepares two or more these lines in the 2nd direction which intersects perpendicularly in the 1st direction, and constitutes a display screen, It has a display image storage means to memorize the display image information which should be displayed on a display device, and a display-control means to make it display on a display device based on the display image information which a display image storage means memorizes.

[0021] Moreover, this indicating equipment has a former image data-storage means memorize the raster image which should be displayed this time, and a 3 time pattern decision means determine the 3 time pattern which doubled resolution three per 1st direction based on the raster image of a former image data storage means, and the display image information based on the 3 time pattern which the pattern decision means determined as the display image storage means 3 times is memorized.

[0022] And a 3 time pattern decision means is set in the raster image which a former image data storage means memorizes. The reference pattern of the rectangle which consists of an attention pixel and a pixel of the sum total $(2n+1) \times (2m+1)$ (n and m are the natural number) individual which encloses this attention pixel is followed. Determining the 3 time pattern which expanded the attention pixel concerned in the 1st direction 3 times, a display-control means assigns a pattern to three light emitting devices which constitute 1 pixel these 3 times, and makes it display on a display device.

[0023] In order for a 3 time pattern decision means to determine a pattern dynamically 3 times by this configuration based on the raster image which a former image data storage means memorizes, it is not necessary to hold a pattern statically 3 times. Therefore, compared with the case where a pattern is

stored statically 3 times, the burden of a system can be mitigated and a cellular phone, a mobile computer, etc. can be applied also to a device with many limits of a system resource.

[0024] And this raster image and the 3 time pattern to this raster image do not need to be known. For this reason, for example, about the image of large range, such as a photograph-of-his-face image downloaded from the server, the subpixel display which improved resolution substantially can be performed and it can display legible.

[0025] In a display according to claim 2, it is $n=1$ and $m=1$.

[0026] By this configuration, a reference pattern is the pixel group of the rectangle of 3×3 , the case where a reference pattern can take becomes 512 kinds, and simple processing can realize a subpixel display.

[0027] In an indicating equipment according to claim 3, the raster image which a former image data storage means memorizes is either the bitmapped image which carried out raster expansion of a bit-mapped font and the vector font, or a raster image which is not a font.

[0028] By this configuration, it indicates by subpixel also with the image of various formats.

[0029] In a display according to claim 4, a 3 time pattern decision means determines a pattern 3 times with reference to a reference pattern storage means to memorize a pattern decision rule 3 times.

[0030] Since a pattern is determined 3 times by reference of a reference pattern storage means by this configuration, a high speed can be asked for a pattern 3 times, and the response of a display can be held good by it.

[0031] In the indicating equipment according to claim 5, the information for pattern matching of a reference pattern is stored in the reference pattern storage means.

[0032] By this configuration, pattern matching can determine a pattern 3 times.

[0033] In the indicating equipment according to claim 6, the bit string which carried out the bit expression of the reference pattern, and the information which shows the 3 time pattern concerning this bit string match, and is stored in the reference pattern storage means.

[0034] By this configuration, a pattern can be searched at high speed and easily 3 times by the bit string.

[0035] In a display according to claim 7, a 3 time pattern decision means determines a pattern 3 times 3 times which performs logical operation based on a reference pattern with reference to the result of an operation of a pattern logical operation means.

[0036] Since a pattern can be determined 3 times only by logical operation by this configuration even if it has not memorized the reference pattern, a storage region can be saved.

[0037] The gestalt of operation of this invention is explained referring to a drawing below.

(Gestalt 1 of operation) The gestalt 1 of operation of this invention is explained first. Drawing 1 is the block diagram of the indicating equipment in the gestalt 1 of operation of this invention.

[0038] In drawing 1, the display information input means 1 inputs display information. Moreover, the display-control means 2 controls each element of drawing 1, and makes it display on a display device 3 based on the display image which the display-image storage means 4 (VRAM etc.) memorize.

[0039] A display device 3 installs three light emitting devices which emit light in the RGB three primary colors, respectively in fixed sequence, constitutes 1 pixel, installs this pixel in the 1st direction, constitutes one line, prepares two or more these lines in the 2nd direction which intersects perpendicularly in the 1st direction, and comes to constitute the display screen. Specifically, it becomes a color LCD, a color plasma display, etc. from the driver which drives each of these light emitting devices.

[0040] The former image data constellation storage means 5 memorizes a series of former image data like font data. One side or the both sides of a raster font and a vector font is sufficient as this font.

[0041] The former image data storage means 6 stores former image data temporarily. The former image data constellation storage means 5 has memorized raster font data, and when there are directions which display the specific raster font data of the display information input means 1 to the former image data constellation storage means 5, as for the display-control means 2, the raster font data of KARENTO of

the former image data constellation storage means 5 is stored in the former image data storage means 6 as it is as former image data.

[0042] Moreover, when there are directions with which the former image data constellation storage means 5 holds vector font data, and displays specific vector font data from the display information input means 1, the display-control means 2 develops that vector font data to a predetermined field, generates a raster image, and stores it in the former image data storage means 6 by using this raster image as a former image.

[0043] Furthermore, when the common raster image which is not memorized by the former image data constellation storage means 5 from the display information input means 1 is inputted, the display-control means 2 develops the inputted raster image to a predetermined field, and stores it in the former image data storage means 6.

[0044] The bit map pattern extract means 7 extracts a bit map pattern from the former image data which the former image data storage means 6 has memorized. The configuration of this bit map pattern is the same as the configuration of the reference pattern contrasted with this.

[0045] Generally, these patterns are defined, as shown in drawing 8. That is, the pixel which attached the central slash is an attention pixel, and these patterns consist of a pixel of the sum total $(2n+1) \times (2m+1)$ (n and m are the natural number) individual which encloses an attention pixel. And when these patterns can take, it is $\times (2n+1) (2m+1) \text{ ***** of } 2$.

[0046] Here, in order to make a system burden light, it is preferably referred to as $n=m=1$. In this case, these patterns are 3x3 pixels, and when these patterns can take, they become 512 kinds. Although the case where it considers as 3x3 pixels is explained hereafter, 3x5, 5x5, etc. can also be changed.

[0047] Now, as shown in drawing 9 (a), when this 3x3-pixel pattern is black altogether, as a pattern is shown in drawing 9 (b) 3 times, a main attention pixel is black and also makes black the pixel which adjoins it.

[0048] On the contrary, as shown in drawing 9 (e), when this 3x3-pixel pattern is white altogether, as a pattern is shown in drawing 9 (f) 3 times, a main attention pixel is white and also makes white the pixel which adjoins it.

[0049] About various patterns which may exist in such medium, the regulation which determines a pattern 3 times is established beforehand. In this case, although it will become 512 kinds as above-mentioned if all regulations are determined, in consideration of symmetric property or the case where it is displayed in white, it can also respond under fewer regulations.

[0050] Although the 1st example which performs pattern matching is started, the above can express this in a bit and can also transform it as follows.

[0051] That is, if black shall be expressed by "0" and white shall be expressed by "1" as shown in drawing 10, 3x3-pixel black and white can be expressed by the bit string (9 figures) of "0" or "1" in order from the 3x3-pixel upper left to the lower right.

[0052] And as shown in drawing 9 (a), when a 3x3-pixel pattern is black altogether, it can express by the bit string "00000000" and the 3 time pattern to this is set to "000."

[0053] On the contrary, as shown in drawing 9 (e), when this 3x3-pixel pattern is white altogether, it can express by the bit string "11111111" and the 3 time pattern to this is set to "111."

[0054] The regulation which determines a pattern 3 times is beforehand established like [case / where it expresses by such bit string] **** about various patterns which may exist in the medium of a bit string "00000000" and a bit string "11111111." In this case, although it will become 512 kinds as above-mentioned if all regulations are determined, in consideration of symmetric property or the case where it is displayed in white, a part of regulation can be omitted and it can also respond under regulations fewer than 512 kinds.

[0055] And by making a bit string into an index, by the storage structure of an array or other common knowledge, the regulation by these bits is associated and is stored in the reference pattern storage means 9. Then, shortly after lengthening the reference pattern storage means 9 by the index, the 3 time

pattern for which it asks can be obtained.

[0056] As mentioned above, a reference pattern and a 3 time pattern relate and the reference pattern storage means 9 memorizes.

[0057] Of course, even if it replaces indicating the bit string of 9 figures by the hexadecimal etc. by other equivalent styles, it does not interfere.

[0058] In drawing 1, with reference to the reference pattern storage means 9, the 3 time pattern decision means 8 uses retrieval by pattern matching like drawing 9, or index like drawing 10, and determines a pattern 3 times.

[0059] Even former image data carries out the part storage of the 3 time image with which the pattern decision means 8 determined the 3 time image data storage means 10 3 times.

[0060] The filtering processing means 11 performs filtering processing which was stated by the term of a Prior art to the 3 time image which the image data storage means 10 memorizes 3 times, and stores in the display image storage means 4 the image obtained by this processing result.

[0061] Next, the flow of processing is explained using the display of drawing 1, referring to drawing 2. First, display information is inputted into the display information input means 1 in step 1.

[0062] When there are directions which display the specific raster font data of the display information input means 1 to the former image data constellation storage means 5, as for the display-control means 2, the raster font data of KARENTO of the former image data constellation storage means 5 is stored in the former image data storage means 6 as it is as former image data.

[0063] Moreover, when there are directions which display specific vector font data from the display information input means 1, the display-control means 2 develops that vector font data to a predetermined field, generates a raster image, and stores it in the former image data storage means 6 by using this raster image as a former image.

[0064] Furthermore, when the common raster image which is not memorized by the former image data constellation storage means 5 from the display information input means 1 is inputted, the display-control means 2 develops the inputted raster image to a predetermined field, and stores it in the former image data storage means 6 (step 2).

[0065] Next, the display-control means 2 initializes the attention pixel of the bit map pattern extract means 7 to an upper left initial position at step 3 (step 3), and a bit map pattern extract in case an attention pixel is in an initial position to the bit map pattern extract means 7 is ordered.

[0066] Then, the bit map pattern extract means 7 extracts a bit map pattern in case an attention pixel is in an initial position from the former image data of the former image data storage means 6, and returns it to the display-control means 2 (step 4). For example, when the slash section of drawing 5 (a) is the initial value which is an attention pixel, the bit map pattern extract means 7 extracts the bit map pattern shown in drawing 5 (b).

[0067] The display-control means 2 will order the 3 time pattern decision which suits delivery and this bit map pattern to the pattern decision means 8 3 times in this, if a bit map pattern is received from the bit map pattern extract means 7.

[0068] Then, the 3 time pattern decision means 8 asks for the reference pattern which suits the bit map pattern which searched the 3 time pattern decision rule of the reference pattern storage means 9, and was received, asks for the 3 time pattern corresponding to the reference pattern for which it asked, and stores it in the image data storage means 10 3 times.

[0069] For example, the 3 time pattern decision means 8 asks for the reference pattern which is in agreement with the bit map pattern of drawing 5 (b), determines the 3 time pattern shown in drawing 5 (c) to it, and stores it in the image data storage means 10 3 times.

[0070] The display-control means 2 performs processing from step 4 to step 7 repeatedly until the processing about all attention pixels is completed, updating an attention pixel (step 9) (step 8). And when the pattern decision means 8 stores a pattern in order 3 times 3 times, the information equivalent to the image shown in drawing 6 will be stored in the image data storage means 10 3 times.

[0071] After this repeat processing is completed, the display-control means 2 makes filtering processing carry out to the filtering processing means 11 to the 3 time image data of the image data storage means 10 3 times (step 10), and the filtering processing means 11 stores the image after processing to the display image storage means 4 (step 11).

[0072] And the display-control means 2 assigns a pattern to three light emitting devices which constitute 1 pixel of a display device 3 these 3 times, and makes it display on a display device 3 based on the display image stored in the display-image storage means 4 (step 12).

[0073] In the example of drawing 6, it will be displayed like drawing 7. here, if drawing 7 is compared with drawing 5 (a), it will be understood that there are few jaggies, and they are markedly alike and the direction of drawing 7 serves as a legible display.

[0074] And if the display-control means 2 is not display termination (step 13), it will return processing to step 1.

[0075] (Gestalt 2 of operation) Next, the gestalt 2 of operation of this invention is explained. About the configuration of the gestalt 2 of operation, only a point of difference with the gestalt 1 of operation is explained. Drawing 3 is the block diagram of the indicating equipment in the gestalt 2 of operation of this invention.

[0076] With this gestalt, unlike the gestalt 1 of operation, a pattern decision rule is not memorized 3 times, but it asks by logical operation processing. That is, as shown in drawing 3, to drawing 1, it replaced with the reference pattern storage means 9, and the pattern logical operation means 12 is established 3 times.

[0077] The logical operation of the pattern logical operation means 12 is explained 3 times, referring to drawing 11. The 3 time pattern logical operation means 12 consists of functions which perform conditional judgment after drawing 11 (b), and return the bit value of triple figures which determines a pattern 3 times as a return value to the decision result about a main attention pixel (0 0) and the pixel (a total of three x3 pixels) which adjoins this like drawing 11 (a). Here, it is the semantics that monochrome any are sufficient as "*" after drawing 11 (b).

[0078] For example, a return value will be set to "111", if all of an attention pixel and the pixel which exists beside that are black as shown in drawing 11 (b). Moreover, a return value will be set to "000", if all of an attention pixel and the pixel which exists beside that are white as shown in drawing 11 (c).

[0079] In addition, the logic which can carry out data processing to the pattern logical operation means 12 3 times is prepared like drawing 11 (d), (e), (f), (g), and --.

[0080] Thereby, also in the gestalt 2 of operation, it will be understood like the gestalt 1 of operation that a pattern can be determined 3 times. Moreover, it can be made easy to mount in a device with a severe limit of a storage region, since it does not depend on a storage region but is based on data processing with the gestalt 2 of operation.

[0081] Next, the flow of processing is explained using the display of drawing 3, referring to drawing 4. First, display information is inputted into the display information input means 1 in step 21.

[0082] When there are directions which display the specific raster font data of the display information input means 1 to the former image data constellation storage means 5, as for the display-control means 2, the raster font data of KARENTO of the former image data constellation storage means 5 is stored in the former image data storage means 6 as it is as former image data.

[0083] Moreover, when there are directions which display specific vector font data from the display information input means 1, the display-control means 2 develops that vector font data to a predetermined field, generates a raster image, and stores it in the former image data storage means 6 by using this raster image as a former image.

[0084] Furthermore, when the common raster image which is not memorized by the former image data constellation storage means 5 from the display information input means 1 is inputted, the display-control means 2 develops the inputted raster image to a predetermined field, and stores it in the former image data storage means 6 (step 22).

[0085] Next, the display-control means 2 initializes the attention pixel of the bit map pattern extract means 7 to an upper left initial position at step 23 (step 23), and a bit map pattern extract in case an attention pixel is in an initial position to the bit map pattern extract means 7 is ordered.

[0086] Then, the bit map pattern extract means 7 extracts a bit map pattern in case an attention pixel is in an initial position from the former image data of the former image data storage means 6, and returns it to the display-control means 2 (step 24).

[0087] The display-control means 2 will order the 3 time pattern decision which suits delivery and this bit map pattern to the pattern decision means 8 3 times in this, if a bit map pattern is received from the bit map pattern extract means 7.

[0088] Then, the 3 time pattern decision means 8 makes logical operation which was mentioned above for the pattern logical operation means 12 3 times perform, and acquires the return value. And the pattern decision means 8 stores the 3 time pattern by this return value in the image data storage means 10 3 times 3 times.

[0089] The display-control means 2 performs processing from step 4 to step 7 repeatedly until the processing about all attention pixels is completed, updating an attention pixel (step 29) (step 28).

[0090] After this repeat processing is completed, the display-control means 2 makes filtering processing carry out to the filtering processing means 11 to the 3 time image data of the image data storage means 10 3 times (step 30), and the filtering processing means 11 stores the image after processing to the display image storage means 4 (step 31).

[0091] And the display-control means 2 assigns a pattern to three light emitting devices which constitute 1 pixel of a display device 3 these 3 times, and makes it display on a display device 3 based on the display image stored in the display-image storage means 4 (step 32).

[0092] And if the display-control means 2 is not display termination (step 33), it will return processing to step 1.

[0093] In addition, it cannot be overemphasized that the configuration which combined the gestalt 1 of operation and the gestalt 2 of operation is also included by this invention. For example, two steps of processings which consist of processing by the reference pattern storage means 9 and processing by the 3 time pattern logical operation means 12 may be performed. Under the present circumstances, after the point of processing by the reference pattern storage means 9 and processing by the 3 time pattern logical operation means 12 is not asked.

[0094]

[Effect of the Invention] According to this invention, since a pattern is determined dynamically 3 times, it is not necessary to hold a pattern statically 3 times, and can apply also to a device with many limits of a system resource. And a display image can be equivalent to the image of not only a raster font but various formats, and even if it is a narrow display screen, the legible display by subpixel is realizable. Especially, in a font display, practical effectiveness is high.

[Translation done.]

* NOTICES *

JPO and NCIP are not responsible for any damages caused by the use of this translation.

1.This document has been translated by computer. So the translation may not reflect the original precisely.

2.*** shows the word which can not be translated.

3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] The block diagram of the indicating equipment in the gestalt 1 of operation of this invention

[Drawing 2] The flow chart of the indicating equipment in the gestalt 1 of operation of this invention

[Drawing 3] The block diagram of the indicating equipment in the gestalt 2 of operation of this invention

[Drawing 4] The flow chart of the indicating equipment in the gestalt 2 of operation of this invention

[Drawing 5] (a) Instantiation drawing of the former image in the gestalt 1 of operation of this invention

(b) Instantiation drawing of the extract pattern in the gestalt 1 of operation of this invention

(c) Instantiation drawing of the 3 time pattern in the gestalt 1 of operation of this invention

[Drawing 6] Instantiation drawing of the 3 time image in the gestalt 1 of operation of this invention

[Drawing 7] Instantiation drawing of the subpixel display in the gestalt 1 of operation of this invention

[Drawing 8] Definition drawing of the reference pattern in the gestalt 1 of operation of this invention

[Drawing 9] (a) Instantiation drawing of the reference pattern in the gestalt 1 of operation of this invention

(b) Instantiation drawing of the 3 time pattern in the gestalt 1 of operation of this invention

(c) Instantiation drawing of the reference pattern in the gestalt 1 of operation of this invention

(d) Instantiation drawing of the 3 time pattern in the gestalt 1 of operation of this invention

(e) Instantiation drawing of the reference pattern in the gestalt 1 of operation of this invention

(f) Instantiation drawing of the 3 time pattern in the gestalt 1 of operation of this invention

[Drawing 10] Related drawing of a bit string and a 3 time pattern in the gestalt 1 of operation of this invention (modification)

[Drawing 11] (a) Definition drawing of the reference pattern in the gestalt 2 of operation of this invention

(b) Related drawing of a reference pattern and a 3 time pattern in the gestalt 2 of operation of this invention

(c) Related drawing of a reference pattern and a 3 time pattern in the gestalt 2 of operation of this invention

(d) Related drawing of a reference pattern and a 3 time pattern in the gestalt 2 of operation of this invention

(e) Related drawing of a reference pattern and a 3 time pattern in the gestalt 2 of operation of this invention

(f) Related drawing of a reference pattern and a 3 time pattern in the gestalt 2 of operation of this invention

(g) Related drawing of a reference pattern and a 3 time pattern in the gestalt 2 of operation of this invention

[Drawing 12] The conventional one-line mimetic diagram

[Drawing 13] Instantiation drawing of the conventional former image

[Drawing 14] Instantiation drawing of the conventional 3 time image

[Drawing 15] The explanatory view of the conventional color decision process

[Drawing 16] (a) The explanatory view of the conventional filtering processing multiplier

(b) Instantiation drawing of the conventional filtering processing result

[Description of Notations]

2 Display-Control Means

3 Display Device

4 Display Image Storage Means

6 Former Image Data Storage Means

7 Bit Map Pattern Extract Means

8 3 Time Pattern Decision Means

9 Reference Pattern Storage Means
10 3 Time Image Data Storage Means
12 3 Time Pattern Logical Operation Means

[Translation done.]